

1999 P 02525

Inslation of
PCT/DE00/02643

Method and apparatus for increasing the resistance to failure of information centers connected to exchanges.

Technical field:

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The invention relates to a method for operating an information center in a telecommunication network, where,

- the information center is connected to an exchange,
- the information center comprises both a mainframe and at least one information desk having at least one telecommunication terminal,
- the mainframe is connected to the exchange,
- the information desk is connected to the exchange and to the mainframe via data transfer devices, and
- the basic function of distributing the incoming calls and setting up a voice link to a telecommunication terminal on the information desk is incorporated in the exchange.

The invention also relates to an arrangement for carrying out the inventive method.

25 Prior art:

The information centers addressed essentially have the task of providing call number information and, if necessary, setting up the connection to the subscriber required by the caller. In addition, these centers normally provide a multiplicity of additional services, including, by way of example, the connection of telephone conference calls, simultaneous translation or monitoring of the length of a call. The functionality of such an information center is also described by the term "Call Center".

The use of a mainframe pursues the objective, firstly, of collecting the status reports from the connected information desks, such as "free" or "busy", storing them centrally and, on the basis of this information,

5 connecting an incoming call to an information desk using the exchange, and secondly of providing those processes and data which need to be available centrally in order to be able to satisfy the demands placed on such an information center, and also of permitting

10 connection to external data networks. A mainframe having the aforementioned properties is also known by the term "Computer Telephone Integration Server", or "CTI Server" for short.

15 The high number of callers to be controlled, and the need for an information center for the telephone traffic, means that failure of such an information center is a serious technical problem.

20 In conventional information centers, such total failure occurs simply if one of the elements contained fails, be it the mainframe, the data line between the exchange and the mainframe, the data lines between the mainframe and the individual information desks or the personal

25 computers on the information desks. Failure of an element can be caused by the failure of the relevant power supply network, for example.

30 US 5848143 "Communications system using a central controller to control at least one network and agent system" dated March 4, 1996 also discloses that it is possible to increase the resistance to failure of an information center by using a "primary central controller" and a "redundant central controller" of

35 identical design thereto. In this context, a central controller performs typical tasks of an information center, for example generating control signals for distributing the calls to the information desks, and

requesting status and utilization level of an information desk. The primary central controller and the redundant central controller are connected to one another via a data line which is used to interchange 5 "heartbeat messages". If, by way of example, the primary central controller fails, this message, reception of which in the redundant central controller is regularly checked, is no longer sent. If it is also not possible to set up a connection from the redundant 10 central controller to the primary central controller using a path other than the aforementioned data line, it is assumed that the primary central controller has failed. The tasks of the primary central controller are therefore performed by the redundant central controller 15 until the primary central controller is operational again.

On the basis of the prior art, resistance to failure is essentially achieved by duplicating the components in 20 question, with the resistance to failure being greater the more components there are available in duplicate. A drawback in this context, however, is that this solution is associated with a comparatively high level of technical complexity.

25 The invention is therefore based on the object of specifying a method for operating an information center of the type mentioned in the introduction in which the cited drawbacks do not arise.

30 Description of the invention:

The invention achieves this object with a method for operating an information center of the type mentioned, 35 where, in addition,

- the exchange continuously checks the ready status of the mainframe and of the telecommunication terminals, including the communication links

thereto, and detects any fault arising,

- the mainframe continuously checks the ready status of the telecommunication terminals, including the data transfer path thereto, detects any fault
- 5 arising and reports this to the exchange,
- if the information desks cannot be reached via the mainframe, the exchange at least performs call distribution and sets up a voice link to a telecommunication terminal on the information
- 10 desk.

In one particularly advantageous refinement of the invention, during fault-free operation, the distribution of calls to the information desks is

15 performed on the mainframe, and at least status reports from the units connected to the exchange are processed within the latter. During fault-free operation of the information center, the exchange thus has comparatively little loading.

20 It is also advantageous if restricted operation of the information center, caused by at least partial failure of the mainframe or of a line connected thereto, is maintained by the exchange on its own until the

25 mainframe is ready to resume normal operation. Changeover from normal operation to restricted operation and vice versa is thus performed fully automatically by the program running in the exchange, and takes place without further action by the staff

30 responsible for the exchange.

In one particularly advantageous refinement of the invention, if a telecommunication terminal on the information desk cannot be reached, at least call

35 distribution and the setup of a voice link to another, ready telecommunication terminal on the same information desk are performed. Duplication of the telecommunication terminals and of the transfer paths

to the exchange significantly increases the resistance to failure of the information center.

The object of the invention is also achieved with an arrangement for carrying out the inventive method,

- in which the information center is connected to an exchange,
- in which the information center comprises both a mainframe and at least one information desk having at least one telecommunication terminal,
- in which the mainframe is connected to the exchange,
- in which the information desk is connected to the exchange and to the mainframe via data transfer devices,
- in which the basic function of distributing the incoming calls and setting up a voice link to a telecommunication terminal on the information desk is incorporated in the exchange,
- in which the exchange comprises means for continuously checking the ready status of the mainframe and of the telecommunication terminals, including the communication links thereto, and also means for detecting any fault arising,
- in which the mainframe comprises means for continuously checking the ready status of the telecommunication terminals, including the data transfer path thereto, and also means for detecting any fault arising and means for reporting this fault to the exchange, and
- in which the exchange comprises means for call distribution and for setting up a voice link to a telecommunication terminal on the information desk if the information desks cannot be reached via the mainframe.

In one advantageous refinement of the invention, the telecommunication terminal provided on the information

desk is a personal computer equipped with means for voice input and voice output, and also with means for connection to the telecommunication network and means for data transfer to the mainframe. The means provided for voice input may be, by way of example, a microphone, and the means provided for voice output may be headphones. For connection to the telecommunication network and to the data network, plug-in cards are used, for example, which essentially permit the data to be converted into a serial data format in line with the respective transfer protocol. The simultaneous connection to a telecommunication network and a computer data network makes it possible to meet the demands placed on the telecommunication terminal in a particularly user-friendly manner. In addition, if the data transfer path to the mainframe fails, restricted operation can be maintained. In this context, the functionality during restricted operation depends essentially on which data and processes are incorporated locally in the personal computer on the information desk. In the course of the disclosure, it may be pointed out that the increasing integration of voice data into the computer data networks means that there is no absolute need for there to be a difference between the data protocols of the telecommunication network and of the data network for the mainframe. This merging is also known by the term "Voice over Internet Protocol".

It is particularly advantageous if the information desk comprises both a telephone and a personal computer having the aforementioned properties. In addition to the advantages already cited, the full functionality of the information desk is maintained even if one of the two telecommunication terminals cannot be reached. Besides this, emergency operation can be maintained even in the event of total failure of the personal computer, for example on account of a power failure,

since the telephone is supplied with the required power by the exchange.

It is beneficial if the telecommunication terminals on 5 the information desk are connected to the exchange by means of ISDN basic accesses, since a signaling channel and associated services useful for an information center are stipulated in the appropriate data transfer protocol.

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Description of the drawing:

The invention is explained in more detail with 15 reference to the figure, which shows the illustrative arrangement of the elements of an information center.

Best way of implementing the invention:

The information center CC shown in the figure comprises 20 a mainframe CTI and a plurality of information desks AP1 to APn which are of identical design and each comprise a telephone TEL and a personal computer PC. In the exemplary embodiment, both the telephones TEL1 to TELn and the personal computers PC1 to PCn are 25 connected to the exchange VST via ISDN basic accesses, but analog connecting lines are also conceivable. The personal computers PC1 to PCn are additionally connected to the mainframe CTI via data lines combined in a bus structure. The mainframe CTI is likewise 30 connected to the exchange VST via a data line.

The illustrative information center works in the manner below, where firstly normal operation but also restricted modes of operation caused by failure of at 35 least one element of the information center are explained:

During normal operation, an incoming call is reported

by a program running in the exchange VST, the "call distribution program", to the program running on the mainframe CTI, the central program. Using the information available on the mainframe CTI, which 5 information also includes the states "free" and "busy" for the information desks AP1 to APn, the central program determines to which information desk AP1 to APn the call will be forwarded. In addition, the mainframe CTI is also used to provide the data and processes 10 needed for full operation of the information center CC, and also the connection to external service providers. The staff at the relevant information desk AP can now use the personal computer PC to provide the service they require. The status reports from the information 15 desks AP1 to APn are continuously recorded both by the central program and by the call distribution program. Apart from collection and storage of these status reports, the call distribution program has no other tasks during normal operation.

20 If the mainframe CTI or a line connected thereto fails, this is detected by means of the call distribution program. The latter then performs the function of call distribution required for an information center CC 25 whatever happens, and connects incoming calls to the telephone TEL or to the personal computer PC on the respective information desk AP. When normal operation can be resumed following repair of the damage, an appropriate report is sent by the central program to 30 the call distribution program. The latter then limits its functionality to the extent provided during normal operation.

35 If a telephone TEL, or its line connected to the exchange VST, on an information desk AP fails, the full functionality of the information center CC is maintained. The same applies for failure of a personal computer PC or of a data line connected thereto, with

services which typically require the use of a computer not being able to be provided, or being able to be provided only to a restricted degree.